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## INSECT DAMAGE IN GRAND FIR CONES

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### ABSTRACT

In this 1961 northern Idaho study, depredation by six genera of cone and seed insects on grand fir caused loss estimated at more than 15 percent of the seed crop. Dissection verified exterior signs of attack in nearly all cones examined after mid-August.

### INTRODUCTION

Cone and seed insects are recognized as important agents of seed destruction in grand fir (*Abies grandis* (Dougl.) Lindl.). Observations of insect losses were made in 1961, a good seed year for grand fir, in a northern Idaho area in conjunction with a study of techniques for ripening cones artificially.

### METHODS

Grand fir cones for this study were collected on the Coeur d'Alene National Forest in a 100- to 200-year-old mixed conifer stand on a northerly slope at about 3,200 feet elevation. Two or three trees were felled and cones collected on each of five dates separated by 10-day intervals. Those cones with external evidence of

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insect infestation, such as entrance holes, frass, discoloration, and deformation, were segregated and 10 to 20 from each date were dissected to determine (1) the kinds and numbers of insect larvae, (2) the amount of seed destroyed, and (3) the dependability of exterior signs of infestation.

These larvae were tentatively identified by comparing their appearance with characteristics described by Keen:<sup>2</sup>

Fir seed maggots	-	<u>Earomyia</u> spp.
White-fir cone moth	-	<u>Barbara</u> sp. (true fir form)
Fir coneworm	-	<u>Dioryctria abietella</u>
Fir seed moth	-	<u>Laspeyresia bracteata</u>
Fir-seed gall midges	-	<u>Dasyneura abiesemia</u>
Seed chalcids	-	<u>Megastigmus</u> spp.

Specimens were preserved for verification, but inadequacy of keys for immature stages prevented definite identification of all but Dioryctria abietella. Because attempts to rear adult specimens were unsuccessful, there is some question about the true identities of species reported.

## RESULTS

Of the 1,633 cones examined, about one-fourth had exterior indications of insect attack (table 1). This ratio did not vary greatly with the date of collection. Although dissection failed to verify suspected infestation in about half of the suspected cones from the two earliest collections, insects were found in nearly all the dissected samples from later dates.

Table 1. Apparent and actual cone infestation on five collection dates

Collection date	Trees sampled	Total cones	Apparent infestation <sup>1</sup>	Actual infestation <sup>2</sup>
			Percent	Percent
7/25	3	291	37	26
8/ 4	2	433	25	10
8/15	3	284	22	20
8/24	2	393	26	26
9/ 3	2	232	24	24

<sup>1</sup> Based on exterior indications of insect attack.

<sup>2</sup> Based on results of dissection.

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<sup>2</sup> Keen, F. P. Cone and seed insects of western forest trees. U.S. Dept. Agr. Tech. Bull. 1169, 168 pp., illus. 1958.



Five genera of insects caused significant cone damage. Maggots, present in about 7 percent of the cones, caused the most conspicuous damage. Maggot infestation ultimately destroys the entire cone; most of these cones had disintegrated by the August 24th collection.

An average of 14 percent of all cones were infested by cone moths or cone-worms. This combined infestation caused an estimated 5-percent seed loss.

Because midges were very difficult to detect, their presence went largely unnoticed in the early stages. But, by the last collection date they were detected in 24 percent of the cones, causing an estimated seed loss of at least 3 percent.

### DISCUSSION

Midge and chalcid infestations are not revealed by outward appearance of cones. Estimates of damage by midges are therefore undoubtedly low. No estimate of chalcid damage was made because only one chalcid was discovered during cone dissection. Many seeds would have to be dissected to reliably estimate the total loss caused by these species.

It appears probable that total losses of grand fir seed to insects in 1961 exceeded 15 percent in the observed area. While of limited scope, this study points out the need to learn more about the influence of environmental conditions, including size of cone crops, on infestations by cone and seed insects, and to determine the possibilities for control.

